

Newcastle disease virus (NDV) is an important pathogen that causes disease and death not only in domestic and commercial poultry, but also in wild bird populations around the world. Current Newcastle disease (ND) vaccines are used widely in commercial poultry and protect the vaccinated birds from disease but do not prevent them from becoming infected and carrying the virulent virus or shedding it in their feces. Therefore, the current vaccines do not eliminate virulent virus transmission from infected to healthy birds.

A vaccine that reduces virulent virus shed and transmission is sorely needed by the poultry industry.

Using reverse genetics technology, researchers in the Endemic Poultry Viral Disease Research Unit and the Exotic and Emerging Viral Diseases Research Unit of the Southeast Poultry Research Laboratory in Athens, Georgia, have developed a new vaccine from parts of a virus that is similar to the wild-type NDV circulating in the environment today. This new vaccine not only reduces mortality and severity of ND symptoms in poultry, but it also decreases the amount of virulent virus shed from vaccinated birds.

“Currently, most vaccines used in the United States are formulated with NDV

isolated in the 1940s, which is similar to the virulent NDV circulating at that time,” says poultry unit microbiologist Qingzhong Yu. “Unfortunately, with time, new NDV strains have emerged that are genetically very different from commonly used vaccine strains.

“Reverse genetics technology enabled us to generate a new vaccine by exchanging a gene from the original vaccine with a similar gene of the current circulating virus. We found that when the new vaccine, containing gene sequences similar to the wild-type virus, was used in vaccination studies, the vaccinated birds were protected from disease and shed less of the wild-type virus after challenge,” says Yu.

Yu, Daniel King (retired ARS researcher), David Suarez, Patti Miller, and former ARS researcher Carlos Estevez (now with Texas A&M) submitted a patent application for the vaccine in 2009. Licensing by the USDA Animal and Plant Health Inspection Service’s Center for Veterinary Biologics would have to follow before the vaccine could be used.

Newcastle Disease Virus Vaccine on the Horizon

NDV causes disease in more than 250 species of birds and typically affects the respiratory, gastrointestinal, and/or nervous system. Symptoms may include gasping, coughing, lack of appetite, drooping wings, and diarrhea. ND is clinically similar to avian influenza, and the two diseases may be confused, which impairs the rapid diagnosis of a disease outbreak.

The most severe form of ND can result in disease and mortality rates exceeding 90 percent in susceptible chickens. The most recent U.S. outbreak—which occurred in 2002-2003 in California, Nevada, Arizona, and Texas—illustrates the devastation and financial cost that can result: More than 3.4 million birds were destroyed, and the cost of controlling the outbreak in California alone was more than \$160 million.

“Newcastle disease continues to be a danger to the commercial poultry industry because it can spread rapidly and can exact a heavy toll,” says Yu. “Vaccines for ND have been used for more than 50 years to control the disease and are successful in reducing mortality and the severity of symptoms. Our goal is to create a vaccine to decrease virus spread as well.”—By

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Microbiologist Qingzhong Yu examines recombinant Newcastle disease virus vaccine candidates in infected cells.



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